How to Make Money with Fertilizers

THE AMERICAN AGRICULTURAL CHEMICAL CO.

New York, Philadelphia, Baltimore, Boston, etc.

1918-JAN.

CORN ON WALKER-GORDON FARM, PLAINSBORO, N. J.

A.A.C. FERTILIZER USED

A Grand $1000 Prize

For a Quality Crop Grown on A.A.C. Fertilizers

In a competition open to the entire United States, this handsome prize was carried off by Mr. D. W. Mitchell of Schuyler Lake, N. Y., who grew his hops on A.A.C. fertilizer. The hops were analyzed and judged by Dr. W. W. Stockberger, Physiologist in the Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C., and the prize was awarded to Mr. Mitchell, for their general excellence. A. A. C. fertilizers bring not only quantity but quality as well.

How to Make Money with Fertilizers

"A soil can be kept fertile indefinitely by the use of chemical fertilizers."—Thomas F. Hunt, formerly Director Pennsylvania Experiment Station.

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Introduction

The following editorial from "Wallace's Farmer" of October 27, 1916, shows the immense importance of fertilizers even to a State whose soils are fertile.

A $30,000,000 PRESENT

"According to the calculations made by the Iowa Agricultural College, if all of the crops Iowa produces each year should be shipped out of the State, they would carry away with them $150,000,000 worth of fertility. However, Iowa feeds to live stock a large amount of what she grows, and, as nearly as can be estimated, our annual loss of fertility through the crops shipped out of the State amounts to right around $30,000,000 a year.

NO SUCH THING AS "INEXHAUSTIBLE FERTILITY"

"In other words, the Iowa farmer is presenting to the people who buy his crops the very handsome sum of about $30,000,000 a year. Now and then we hear folks talk about inexhaustible fertility. There is no such thing. Iowa soils are very fertile. Probably nowhere else in the world is there so large a body of fertile land; but at the rate we are going, this fertility inevitably will be exhausted; and it will be exhausted all the more rapidly if grain prices advance, and Iowa farmers cannot figure a profit in feeding live stock. The time will come—and it is not so far off as some folks think—when Iowa farmers must put back, in the form of fertilizers of some sort, an equivalent of the fertility that they are selling in the crops. And when this time comes, we must get enough more for the crops to pay the cost of this fertility."

In other words, the Iowa farmer must make money with fertilizers. Perhaps he can learn something in this direction from this pamphlet, which has been prepared for the purpose of encouraging the most intelligent use of concentrated commercial fertilizer.

The "Rural New-Yorker," Oct. 9, 1915, says, editorially:

"The best and most profitable farming in America today is based on the liberal use of chemical fertilizers, and this will be true more and more in the future."

The "National Stockman and Farmer" says, editorially:

"Every acre of land that has ever been productive may be made so again. This is the message of hope that agricultural science brings to the man who owns a run-down farm. Methods of improvement may vary according to circumstances, ***but the use of commercial fertilizers is the first great essential.*** Fertilizers to make something grow on this barren land, manure from the crops grown, lime, legumes and tillage—these are the essentials in the rebuilding of a soil. Properly managed, the returns more than cover the cost of the work of restoration, and ***the owner has $100-land instead of worthless land after a few years.*** Is it worth while? It is, and no prejudice or parsimony should delay the start, which calls for the outlay of money for fertility that comes in bags. ***If the impoverished soils of this country are to be made productive by the generation that owns them now, fertilizers must be used to start the process.*** Nature will restore fertility in the course of time, but this generation will not be here to see the end of her effort. Man's method is quicker and more profitable to him and to the country."

A MONEY-MAKING CROP OF WHEAT

Mr. David J. Perrin, Middlesex County, N. J., writes: "I used A.A.C. fertilizer last fall and the results are so entirely satisfactory that I am sending you a picture of my field of wheat, grown with it. I shall certainly use the same brand again this fall. Not only is the wheat one of the best crops I have ever grown, but the grass promises equally well."

How to Make Money With Fertilizers

WHERE THE PROFITS ARE FOUND

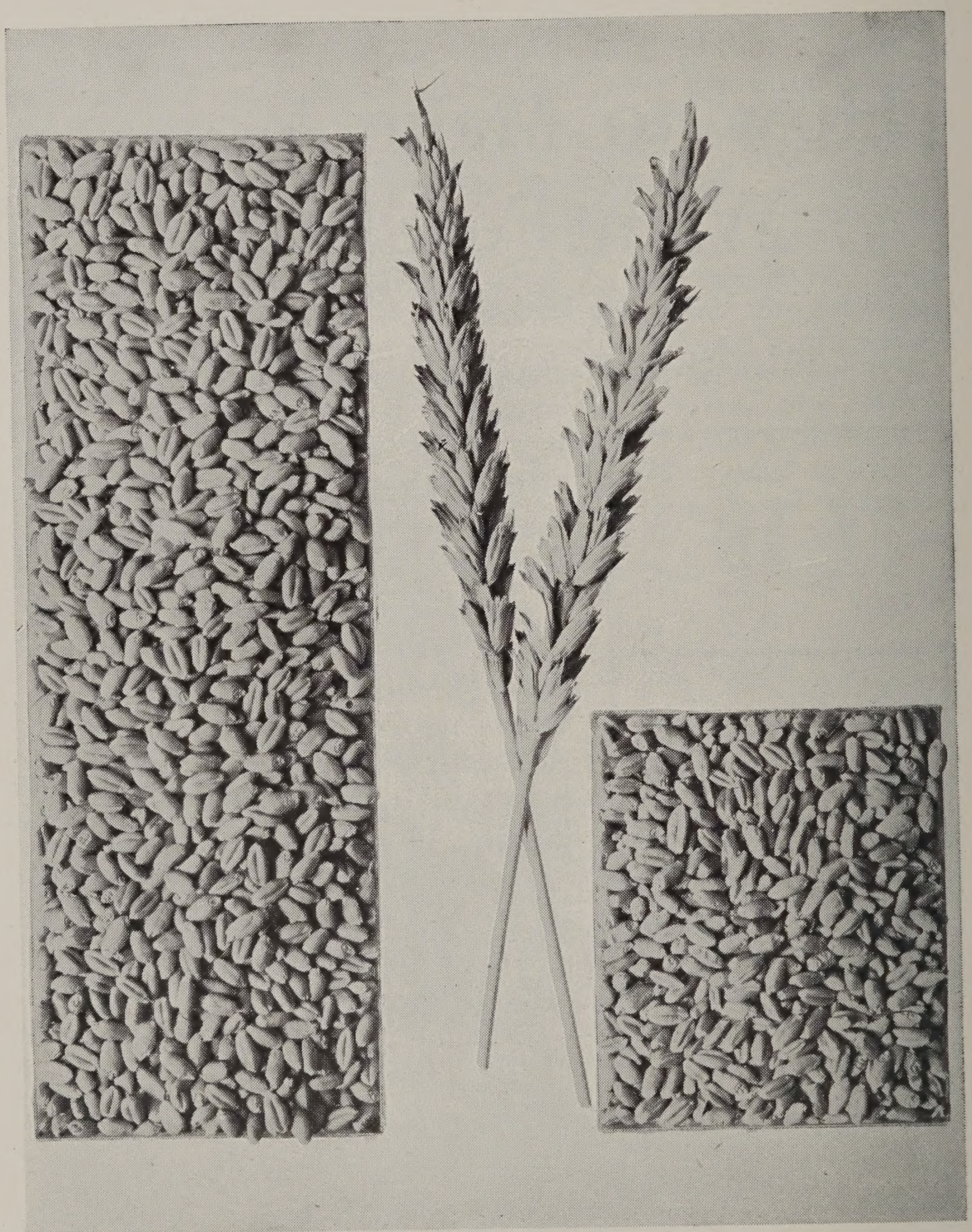
OF ALL THE MONEY MADE ON THE FARM by using fertilizers, a good part is in the shape of actual cash received from the sale of increased crops. Many good farmers do not even yet realize, however, in how many different directions they really have made money by the proper use of good fertilizers. Apparently the cash return itself seems sufficiently large to them, and in fact usually it is a handsome profit. But there are additional profits. For example, how many farmers credit the fertilizer with the increased quantity of fodder raised and fed to the farm stock?

I. IN THE QUALITY OF THE CROP

When the quality of the crop is a factor in making the market price, as it is in wheat, corn, tobacco, oats, fruit, potatoes and truck, the right use of a good fertilizer by improving the quality of the crop, makes money for the grower by increasing the price, after having increased the crop itself.

The experience of H. F. Sickmeyer, Jackson County, Ill., is an example. In the fall of 1914 he seeded forty acres of wheat.

How Fertilizers Bring a Greater Return for Quality



Fertilized Wheat
$1 per bushel

Unfertilized Wheat
70c per bushel

Wheat grown by Mr. H. F. Sickmeyer, Jackson County, Illinois. Twenty acres were fertilized and a like area was not. As a result of the use of 200 pounds of fertilizer to the acre, the yield of wheat was increased 11.5 bushels to the acre. The fertilized wheat, because of its greater plumpness, sold at $1.00 a bushel, whereas the unfertilized brought only $0.70 a bushel. (See opposite page.)

On twenty acres he applied A.A.C. fertilizer, 200 pounds per acre, and on the remaining twenty he used nothing. The yield from the fertilized area was 390 bushels while the unfertilized portion produced but 160, a difference of 230 bushels in favor of the fertilizer. The difference in quantity alone paid him of course, but more important is the fact that the fertilized wheat weighing 58 pounds to the bushel, sold for $1.00, while the unfertilized weighing only 50.5 pounds to the bushel brought only 70 cents.

390 bushels at $1.00 per bushel . .	$390.00
160 bushels at .70 per bushel . .	112.00
**Increase due solely to fertilizer .	$278.00**

Nearly every farmer can recount similar instances that have come under his own observation, where the fertilizer has made a money return for quality as well as for quantity. The increased crispness and succulent quality of truck grown on soluble fertilizers is well recognized. Crops of this sort bring a better price, hence a larger profit to the grower. There has been increasing complaint that corn fails to ripen before frost. The loss from soft corn has been large. Growers incline to blame the seed, or the season, but the real reason probably is that their system of farming has taken from the soil the plant food necessary to mature the crop, and consequently it is unable to ripen. Where proper fertilizers are used, the corn makes a steady and constant growth, and the fertilizer makes money for the farmer by ripening his corn crop before frost; again a matter of improving the quality and the market price.

II. IN HASTENING MATURITY

The thoroughly ripened, hard wheat, the matured, hard, A1 corn; the best cooking potato, which is the ripe potato, all the product of rightly made fertilizers, also the early crop, of truck command the best prices. Fertilizers, by hastening maturity, bring an early, crisp, attractive crop into the market, netting an advantage in price which should go to its credit.

III. IN THE INSURANCE OF THE CROP

The extra weight and feeding value of fully matured corn over soft, watery, immature corn is well known, and many corn growers insure their crops by applying the right fertilizers. These give the plants a start and enable them more successfully to withstand drought, disease and insect pests. The well-fed, well-nourished plant grows quickly and matures the heavy grain; the underfed

plant lags behind and is caught by the frost. In fighting the Hessian fly, that great pest of our wheat fields, fertilizers have paid by making it possible through late seeding with soluble plant food, to outwit the fly and secure a crop, which otherwise would have been damaged beyond recovery. The cotton boll weevil is another pest that is being fought with fertility of the right sort in connection with brainy farming. The farmer makes money with the fertilizer in the protection it gives him in insuring his corn and other crops against drought, insect pests and disease.

In reality fertilizers are the cheapest form of crop insurance. Many times, a lack of available plant food has caused the failure of a crop that otherwise would have been profitable. After the land has been plowed and fitted, it surely is short-sighted policy to risk losing the cost of the labor, the seed and the use of the land, by neglecting the fertilizer necessary to give the crop an early start, increase the yield and hasten maturity. A well fertilized, seasonably planted and well cared for crop almost invariably comes through any fair season in good shape. It is on the infertile, poorly cultivated soils that crops suffer most from poor weather conditions. Farmers insure their buildings; why not their crops? Loss from crop failure is more likely to occur than loss from fire. By insuring crops against loss due to lack of suitable plant food is another way that farmers make money with fertilizer.

IV. IN THE SUCCEEDING CROPS

While it is true that most fertilizer is bought for its benefit on the crop to which it is applied, it is also true that benefits to succeeding crops are greater than are commonly realized.

The Cornell Experiment Station conducted a series of experiments with fertilizer on a run-down farm. Where complete fertilizer was used the area produced 6615 pounds of hay per acre, and an equal area unfertilized yielded 2901 pounds of hay per acre. In this instance the fertilizer more than doubled the yield.

But, most interesting, after these plots were in timothy three years they were plowed and planted to corn. No additional fertilizer of any kind was used, and at harvest time the plots which had received no fertilizer gave an average yield of 30.4 bushels of corn per acre, while the plots which had received the complete commercial fertilizer on the grass gave an average yield of 56.8 bushels per acre, an increase of 26.4 bushels per acre, due solely to the lasting effect of the fertilizer. The fertilizer had already paid a handsome profit on the grass, and the grain represented so much additional clear

profit. The increased value of the stover also was almost as great as that of the grain.

Prof. Hunt, formerly of the Pennsylvania Station in commenting on these experiments, says: "Even to the hardened investigator, these results come almost as a revelation. All that was done was to apply broadcast at the right time from one-fifth to one-tenth of an ounce per square foot of a commercial fertilizer."

V. IN PERMANENTLY IMPROVING THE SOIL

In presenting the 1914 annual report of the progress of the Wisconsin Agricultural Experiment Station, Dean H. L. Russell draws attention first to the study of the foundation of all agriculture, the soil, in the following words:

"The soil is the great fundamental asset in our national wealth. Out of it comes life and sustenance for the whole world of nature and mankind. Formerly it was customary to look upon it merely as a mass of inert particles, but we know that it is composed of the most complex materials and in place of being dead and inert, it is pulsing with myriad forms of life. These living organisms act and react, not only on each other, but on the complex soil particles with which they come in contact.

"The processes of soil formation are continually in the making. Weathering is slowly but constantly releasing new plant food, while at the same time the processes of depletion, erosion, leaching and waste are lessening the value of this asset.

"***To conserve this bank account and to transmit it unimpaired to future generations, is a duty which the human race owes to posterity,*** but as with nearly all of our natural resources, man has wasted more than he has used. In earlier years when knowledge did not exist, or was imperfectly appreciated wanton practices led to rapid depletion or exhaustion. Every virgin area that has been opened up for settlement by man has had its pioneer generation of soil-miners, but if future human life is to receive adequate support from the soil, sooner or later ***the soil-tiller must quit robbing his land and feed his soil as he feeds his flocks.***

"The last decade or two has brought the American farmer to a more complete realization than he has ever before known, of the duty that lies before him. The lessons that China and Japan learned a thousand years ago or more made their way slowly toward the Occidental World. Even the teachings of old England and the plains of continental Europe fell heedless on American ears. To our fathers, the so-called inexhaustible fertility of the magnificent Mississippi Valley could never be used up, but the declining crop yields of a section, whether it is wheat, corn, or cotton, spell lessening profit and impairment of capital.

"Science has now shown in no unmistakable terms that as the chain is no stronger than its weakest link, so the soil is no richer

Harvesting string beans on farm of J. Tippert, at Danvers, Massachusetts. The vegetable grower has learned that the liberal use of A.A.C. fertilizers is essential to large profits.

than its content of its most indispensable element. If depleted of potash or phosphorus, whether by age-long leaching, or more rapid robbery by careless crop production, matters little. The effect is the same.

"Therefore, the fundamental problem is to know how to manage our soils so that not only will they bear fruit, but *while doing so they will also retain their original fertility.*"

Additional evidence of the lasting effect of commercial fertilizers is given in Bulletin No. 155 of the Indiana Experiment Station: "It is commonly believed that manure gives more lasting results than commercial fertilizer but when compared with an application of fertilizer containing about an equal amount of plant food, the manure was not found to have any greater lasting effect."

In speaking of other experiments the bulletin states:

"It has been repeatedly shown that fertilizer shows marked results for one or more years after the application depending on the kind and amount used, and that the proper use of fertilizers for grain is quite generally of great assistance in securing a good stand of clover, and in causing it to grow into a good crop. The increased crop of clover of course increases the prospects of a good corn crop, so all in all it seems that *the first direct profit from fertilization may be but the smaller part of the total profit.*"

In the rotation experiment carried on at the Rothamsted Experiment Station, England, where artificial fertilizers were supplied to the root crop the effect of this application on the hay crop which was harvested two years later was an increase of about 27 hundredweight per acre, and the yield of wheat which followed the hay crop was increased by approximately nine bushels per acre.

VI. IN THE INCREASE OF SOIL BACTERIA

After the money crop has been harvested from the field supplied with commercial fertilizer, there is another benefit to be placed to its credit. Scientists have proven that the soil organisms or bacteria are of prime importance in crop production. These tiny organisms play a most important part in farming. A description of their beneficial activities would make in itself a large volume. We can only say here that some species have the power to fix the atmospheric nitrogen and render it available for plants, while others attack the humus or organic matter in the soil and enable the crop to utilize the plant food it contains. The secondary effects of fertilizer in developing this bacterial growth are often as profitable as those obtained on the first crop.

At the Wisconsin Experiment Station a study has been made of the effects of commercial fertilizers on soil bacteria. Briefly, their experiments show that the use of these fertilizers causes an increase in the formation of ammonia, in carbon-dioxide evolution and in the total number of bacteria. They say:

"The results of the work suggest that possibly the increased crop production of a soil resulting from the application of soluble phosphates is in part due to the promotion of bacterial activity. On the one hand by the increased ammonification and consequent conversion of ammonia into nitrates, more nitrogen becomes available for rapid plant growth. The increase in carbon dioxide favors the solution of the insoluble minerals of the soil and thus helps us to render available those mineral constituents needed for plant food."

Dr. Jacob G. Lipman, Director of the New Jersey Experiment Station, who has made the study of the soil his specialty, supports this view. He says:

"The use of commercial fertilizers helps still further to make the soil a more fit dwelling place for a host of bacteria. * * * * It has been shown conclusively that soluble phosphates stimulate the growth of the species that produce ammonia and nitrate out of vegetable and animal matter. They stimulate likewise the activities of the several species of so-called nitrogen-fixing bacteria."

These are strong words but they come from recognized authority.

Thus the farmer makes money with fertilizers by increasing the bacterial activity of his soil. It is a benefit that cannot be accurately measured but it is a most decided benefit nevertheless.

VII. IN FREEDOM FROM DISEASE GERMS

We have seen how the farmer makes money with fertilizers by increasing the soil activity. But as there are beneficial bacteria, likewise there are harmful bacteria or germs. Just how many cases of anthrax, foot-and-mouth disease, lockjaw and hog cholera, have been due to the use of manure from infected animals or of untreated refuse materials, would be difficult to state. Many plant diseases have been spread by the same means, and while of course every farmer should use the manure made on his own farm, the purchase of manure at prevailing prices and considering the amount of plant food it actually contains is expensive. Properly prepared commercial fertilizers are absolutely sterile. They contain no germs of plant or animal disease, no weed seed, are easier to apply,

can be kept indefinitely and applied to the plant at any stage of growth that conditions require and when the actual amount of plant food is considered, are the cheapest source of plant food available. The farmer makes money with them through their insurance against disease in his house, his barn and his fields.

VIII. IN FREEDOM FROM WEEDS

"A penny saved is a penny earned," runs the old proverb; and in the freedom from weed seeds we find an additional source of profit from commercial fertilizers in reducing the cost of growing a crop by making it unnecessary to spend as much labor for weeding.

Husky farmers and husky corn. Yield of silage 34.4 tons per acre on A. A. C. fertilizer.

Photograph of silage corn grown on A. A. C. fertilizer, at Florham Farms, Madison, N. J. Mr. J. L. Hope, Supt., writes: "I have used your brands of fertilizer for 2 years with most excellent results. This year I planted silage corn on 80 acres of medium clay land, using 350 pounds of fertilizer. The yield, as the photograph shows, was a good one."

How to Make Money with Fertilizers

I. BY KNOWLEDGE OF THE SUBJECT

In his widely-known treatise, "Plant Food," the late William H. Bowker said:

"Almost as much depends upon the proper use of fertilizers as upon their composition. We must remember that chemically prepared fertilizers are ***prepared plant foods;*** that for best results they should be applied to a properly prepared seed bed or field. To feed highly concentrated foods to an old, winded horse or a sickly cow exposed to the cold and wet, is usually money and labor thrown away; so it is money and labor poorly expended to buy commercial manures and apply them to sour, wet, half-baked land, or to land half plowed and poorly prepared.

"Again, it is money poorly expended to apply chemical manures to land where poor seed is used, or where, after the crop has come up, it is neglected. Weeds, as well as cultivated crops, thrive on fertilizers. The only merit which weeds possess (if they possess any merit at all) is that they sometimes do for the farmer what he has neglected to do for himself. If he neglects to cultivate and protect the original crop which it is good for him and the soil to grow, provided it is properly grown, weeds step in and cover the ground, protecting it, and, when plowed in, supply a certain amount of plant food and humus that is good for the soil.

"The modern farmer keeps the horse cultivator going almost constantly. He does not wait until the weeds have come up, but he nips them before or as soon as they have germinated, thus not only destroying the seed or the weed itself, but before it has got a footing, and long before it can go to seed to reproduce itself in the same field another year. In fact, the modern farmer cultivates, not to destroy half-grown or full-grown weeds, but for the good of cultivation itself — to keep the surface of the soil in a fine, friable condition, to form a mulch on the surface which is known to conserve the moisture of the soil and thus to offset the effect of drouth; also,

to thoroughly mix the fertilizer or manure with the soil in order that each pound of soil may have its grain of plant food, and in order that the little rootlets may have an easier and better place in which to feed. Finally, he cultivates to admit the air and warmth in order to promote a crop of bacteria in the soil, without which the crop above the soil will not thrive.

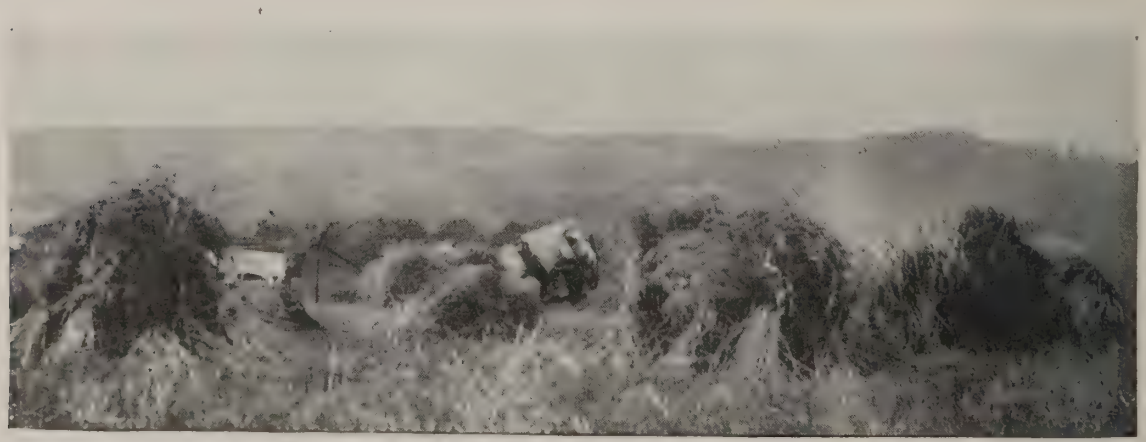
"The modern farmer, therefore, cultivates ***to enrich his soil,*** for that is what he really does when he conserves moisture and encourages the growth of bacteria. The killing of weeds is only incidental. In fact, if he has been thorough in his previous treatment of the soil, he practically has no weeds to kill, for they have been cultivated to extinction, except in case of frequent application of stable manure."

The stock breeders' saying "Breeding is fifty per cent and feeding is fifty per cent," is equally true of plants. Farmers have accomplished wonderful results by careful seed selection and proper fertilization of corn. Other crops respond equally well. The farmer who both "breeds and feeds" usually is a successful one.

The "Farmer's Guide" of Indiana, says editorially, June 19, 1915:

"We must farm better than we are now farming. We must plow deeper, drain our land more effectively; manure, fertilize and cultivate, and plant better seed."

Dairymen make money by feeding their cows alfalfa or clover hay, cottonseed meal, gluten and bran, instead of cottonseed hulls and straw, because these concentrates contain much more milk-making material. Commercial fertilizers are concentrates for plants, and are as profitable to the crop grower as the food concentrates are to the dairyman. The plant responds to the character of its food as dairy cows respond to the character of their food.



This photograph was taken July 23, 1916, and shows a field of rye on the Whitney Point Stock Farm, Geo. H. Greaves, manager, located at Whitney Point, Broome Co., N. Y. When cut, the rye measured over 6½ feet high; 200 lbs. per acre of A. A. C. fertilizer was used.

II. BY USING AVAILABLE FERTILIZERS

Plants obtain their mineral food supply from the soil, and, as a rule, before any food is taken up by the roots it must be dissolved. Different crops vary in their ability to take up their food from the soil. This is evidently determined by the extent to which their root excretions act in conjunction with the soil moisture.

As most fertilizer is applied at planting time, the plant food should be in such forms that all of it does not become immediately available. A portion should become available gradually, so as to give the crop a supply during the entire season. It is of no benefit to furnish the crop during the first stages of growth with an amount of nitrogen greater than it can use, and then just at the critical time when the seed is forming let the crop fail for lack of food. Three square meals every day is better than a feast today and a famine tomorrow, and the plant food in our fertilizers is present in such forms that the plant will be well nourished from seed time to harvest. Money is made with such fertilizers. Money has been lost with home-made or improperly mixed fertilizers in which this principle has been neglected or forgotten.

Sometimes farmers are tempted to try insoluble materials because they can be bought at a lower price — as, for example, rock phosphate instead of acid phosphate. But the farmer who wants to make money with fertilizers will do well to post up where he can see them every day, the following statement published in Bulletin 187 of the Purdue University (Indiana) Agricultural Experiment Station :

"The per acre net profit has been over six times as great from acid phosphate as from rock phosphate.

"The per dollar invested profit has been over seven times as great from acid phosphate as from rock phosphate.

"The value of the crop increase per pound of phosphorus applied has been twenty-eight and one-third cents for the acid phosphate and three and one-half cents for the rock phosphate."

III. BY USING SUITABLE FERTILIZERS

Not all cultivated crops require the same amounts of the various plant foods. Grass does best when top-dressed with fairly large amounts of available nitrogen in the formula. Phosphoric acid seems to be the important plant food to consider for corn and grain, while potatoes and tobacco call for rather more potash. Although most farmers have found, thanks to their previous generous treatment of

MAKING A SECOND APPLICATION OF FERTILIZER

This photograph shows a field of lettuce grown on A.A.C. fertilizers by George F. Fish, Middletown, N. Y., 1916. The laborers are making a second application of the fertilizer, scattered along the rows and stirred in.

their land with respect to potash, that the temporary shortage of that element due to the war, has worked no particular hardship. When normal conditions again prevail, root crops and tobacco can be given their usual supply.

Different crops require different treatment, and for best results it is best to use the special crop brands. It is well known that a top-dressing fertilizer should be different from one that is introduced into the soil. The food requirements of cabbage, lettuce, and cauliflower are different from those of fruit, and then again onions, potatoes, beets and carrots differ from corn, wheat and grass in their requirements.

Through centuries of selection and cultivation man has changed the character and increased the yield of the principal farm crops. In its wild state the potato yields only a few small tubers, and reproduces itself by seed. When left alone cabbage runs to a seed stalk, but we cultivate it for the head alone. Good authorities state that wheat could not exist without man's care and attention.

As we have changed the nature of most of our cultivated crops, so we must change methods of cultivating and feeding them. The old method of relying wholly on unbalanced, slowly available materials must give way to quicker, surer and more scientific methods.

Soils vary as well as crops, and by taking all these things into consideration it is possible by using properly proportioned fertilizers, to solve the problems on each individual farm in a way that means larger yields and lower cost of production. This is another way money is made by using fertilizers.

IV. BY USING THEM AT THE RIGHT TIME

Perhaps the greatest benefit to the farmer, and a source of profit in the use of commercial fertilizers, comes from the fact that they enable him to supply his crops what they need ***when they need it;*** to apply them at any time conditions render it advisable. One is not obliged to depend upon one application, but in a cold, backward season may make additional applications after the crop is up. Often when the crop has made a poor start owing to a late, cold spring an extra application of available fertilizer overcomes unfavorable weather conditions. Particularly is this true of truck crops growing on sandy soils. Top dressing wheat early in the spring with a quick-acting fertilizer pays well. Two bushels of wheat pays for the fertilizer, and the return is often five to ten bushels.

That's another way money is made with fertilizers.

V. BY USING THE RIGHT KIND

The farmer who makes money with the fertilizers he applies uses those that are chemically combined and blended; that have had a long seasoning by standing in the pile. The manufacture of available fertilizer, the profitable crop-growing kind, is something more than throwing a number of materials together and stirring them with a shovel. When an application of 400 pounds of fertilizer is made to an acre of land, it amounts to less than one-sixth of an ounce to the square foot. How important it is then to know that each bag of this fertilizer contains the right proportions of plant food. It is to insure that sixth of an ounce being in perfect and finely divided condition, that fertilizer manufacturers have been obliged to make such large investments in plants, chemical laboratories, special machinery and storehouses. The best fertilizers are made several months before they are used, allowed to season or "condition" in large bins, then re-ground and bagged. This treatment not only insures their good, dry, drillable condition, but what is more important, mixes, and blends the different ingredients intimately and uniformly.

BULK IS NOT FERTILITY

While on this point let us say that the value of a bag of fertilizer cannot be judged by its bulk, as some farmers may think. Bulk is not fertility. Manure is bulk and fertility combined, but a hundred-pound bag of fertilizer contains more fertility than a ton of ordinary manure. The farmer who makes money with fertilizer doesn't want bulk when he buys fertilizer — he is after fertility; he can get all the bulk he needs cheaper at home by plowing under green crops and plant residues, manure and compost. A big fertilizer bag doesn't mean a rich fertilizer.

VI. BY USING ENOUGH

With good prices for farm products the farmer cannot afford to take chances of crop failure. There are conditions over which he has no control, but the most important one, food supply is not one of them.

To make money with fertilizers, enough should be used per acre to supply what the soil lacks to meet the needs of the crop expected. ***A full crop never came off a half-fed soil.***

The most successful potato growers have found it highly profitable to use commercial fertilizers in quantities that seem surprising to many. Why do the Maine potato growers have a full crop when

other sections of the country do not? The one difference in practice that stands out conspicuously is their custom of applying from 1500 to 2000 pounds per acre of rich, available commercial fertilizer. The Maine farmer is not at all backward about putting on an extra few hundred pounds to the acre if conditions seem to render it necessary. He knows that it pays.

The North Carolina Experiment Station, reporting tests conducted for a series of years with cotton on two types of soil with increasing amounts of fertilizer, shows the increasing profits for the larger applications, as follows :

Quantity of Fertilizer per Acre	Profit on Clay Loam	Profit on Fine, Sandy Loam
200 lbs.	$16.00	———
400 lbs.	$27.59	$11.45
600 lbs.	$32.30	$17.04
800 lbs.	$33.84	$25.33

In Bulletin No. 169 of the North Carolina Experiment Station, Professor Burgess says : " You cannot make land too rich for corn." He also says that " no farmer has ever yet taken a piece of poor land and grown enough feed and forage on it to feed enough stock to make enough manure to bring it up." This statement shows that it is necessary to seek outside sources of plant food if the fertility of the land is to be maintained, and this is where money can be made with commercial fertilizer.

The principle is as true in other states as in North Carolina.

SOME INTERESTING STATISTICS

The value of commercial fertilizer in increasing crops, and thus adding to the country's wealth, is made clear by comparing the acre yields of farm crops obtained in states using fertilizer with the yields obtained in states that have not yet taken up its use. For example, compare New England crop yields with those of Illinois, Iowa, Missouri, Nebraska and Kansas, as taken from the year-book of the Department of Agriculture, 1915, and the United States census, 1910 :

	New England	Above-named Western States
Per cent of farmers using fertilizer	**60.9%**	**2.6%**
10-year average yield of corn	41.06 bushels	28.3 bushels
10-year average yield of wheat	25.7 bushels	16. bushels
10-year average yield of oats	34.6 bushels	28. bushels
10-year average yield of potatoes	150. bushels	75. bushels

New England is sometimes pictured as a section of run-down farms, but the above figures appear to show the contrary. New England is making money by using fertilizers freely. The rest of the country is rapidly finding their use equally profitable.

375 bushels per acre grown by C. W. Sprague, Nassau County, N. Y., with 1800 lbs. per acre of A. A. C. Fertilizer.

HOW THE USE OF FERTILIZER HAS INCREASED

(U. S. Census)

FERTILIZER PRODUCTION	
1869 . . .	$ 5,815,118
1879 . . .	23,650,795
1899 . . .	44,657,385
1909 . . .	111,871,481
1914 . . .	168,388,405

VII. BY OCCASIONAL LIMING

"Why doesn't clover grow like it used to?" is a common question, and in nearly every case the answer is, "Clover cannot grow in a sour soil. The land needs lime."

The crops grown in past years have removed the available lime from the soil, and if very finely ground limestone is applied at the rate of two or three tons per acre, undoubtedly clover will thrive as luxuriantly as before.

Here's a simple way to find out whether your soil needs lime.

Buy a few strips of blue litmus paper at any drug store. Place one in the bottom of an ordinary tumbler and cover it with an inch or two of soil from the field. Add enough water to moisten, and allow to stand for half an hour or longer. If the paper turns red the soil needs lime. Repeat this operation with soil from various parts of the field.

Slaked or hydrated lime may be used on stiff clays where quick improvement of their physical condition is desired, but generally if the railroad haul is not great and the cost of hauling from the railway station to the farm is not prohibitive, finely-ground limestone is the best and cheapest form of lime to use. When the transportation charges are high, burned lime may be bought and slaked on the farm, thus reducing the freight and hauling charges practically one-half. Care should be taken not to use too much air-slaked or hydrated lime at any one time on light sandy and gravelly soils, and even on other soils excessive application should be avoided.

Remember, however, that lime is not a fertilizer as we consider fertilizers, but only an aid to fertilizer. It adds no nitrogen, phosphoric acid or potash to the soil. It makes the soil conditions more suitable for bacterial and plant growth, just the same as a furnace in the house renders it more comfortable and healthful. The constant use of lime without adding any fertilizer will make the soil eventually poorer than it was before. By the proper use of lime, however, it is easier to make money with fertilizers, for it makes them

A field of seed onions grown by E. W. Knight, Newburyport, Massachusetts. Onions which are well fertilized yield heavy, productive seed, the basis of future big crops.

more efficient. Lime should not be applied to land immediately before planting potatoes, as it is likely to cause scab if applied the same spring.

VIII. BY INTELLIGENT CULTIVATION

To make money with fertilizer it should not be applied in hit-or-miss fashion and expected to produce results. All plant food must be dissolved by aid of the soil-water before the plants can use it. Therefore conserve the soil-water by the necessary attention to cultivation. Proper cultivation serves several purposes. It destroys weeds, which would otherwise draw from the soil large amounts of soil-water and plant food. It stirs the soil so that air and warmth can better penetrate it. It thoroughly mixes the fertilizer with the soil, and, most important of all, conserves much of the moisture contained in the soil which otherwise would be lost by evaporation. It holds it in the ground where it can dissolve the plant food to nourish the plant. Thorough cultivation is indeed a most important factor in making money with fertilizers.

IX. BY PROPER CROP ROTATION

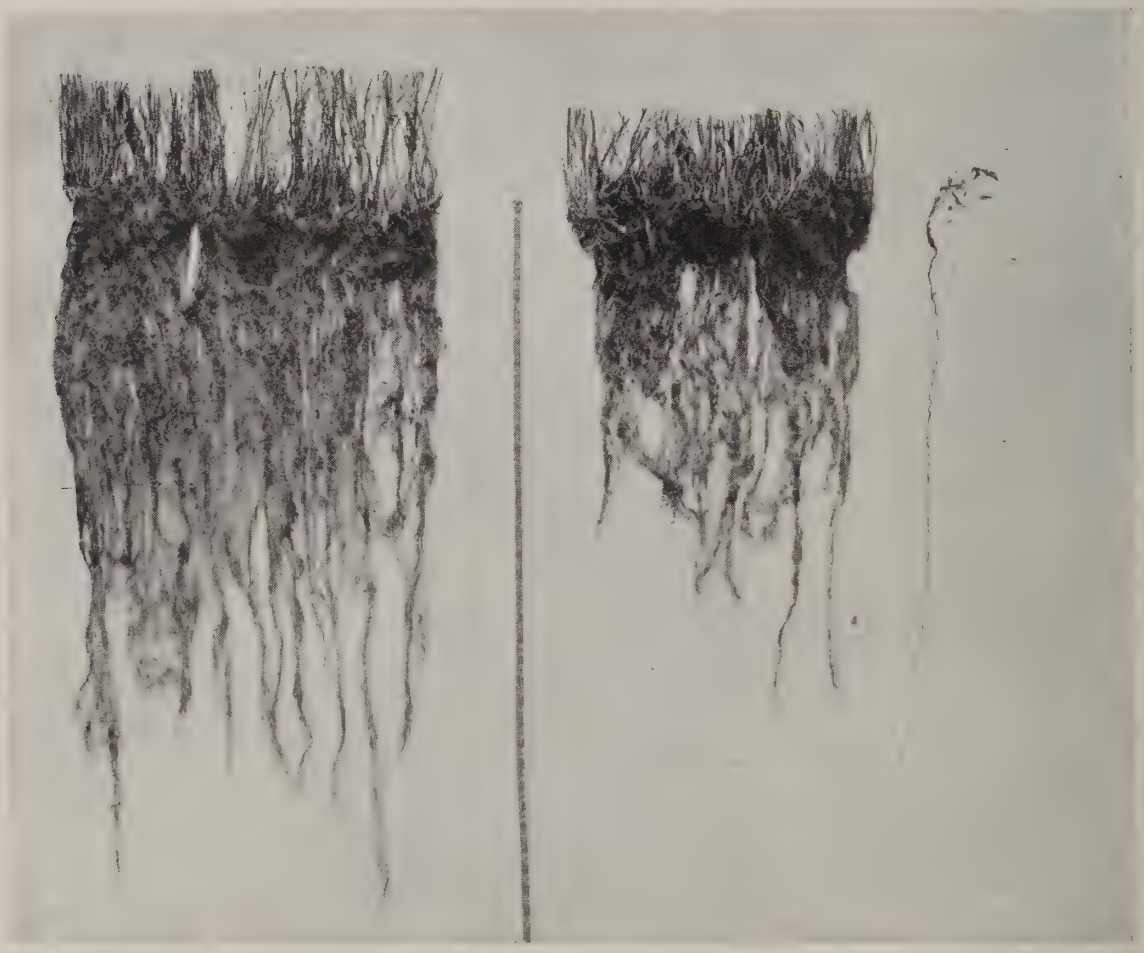
Another most important feature is a proper crop rotation. By this we mean a system of growing crops that does not allow the same crop to occupy the land two years in succession. Rotation prevents much loss of fertility and helps to avoid the constantly decreasing yields caused by the one-crop system. It also enables the various crops to better utilize and make money with the plant food applied, and reduces the loss from insect pests and plant diseases.

X. BY GOOD PREPARATION OF THE SOIL

In order to get the most profitable action from the fertilizer applied, good preparation of the soil is essential. Jethro Tull, the inventor of "horse husbandry" was the first to publicly and persistently advocate the thorough preparation of the seed bed, and owing to the large yields obtained by his method, did much to bring about an improved method of farming. He believed that plants

actually absorbed the fine particles of earth, and claimed that better soil preparation increased the "pasturage of the plant." We now know that the reason for the larger yields obtained from proper tillage and cultivation was the better condition of the soil, enabling air to penetrate deeper, the feeding roots to spread more easily, encouraging bacterial activity and reducing the evaporation of moisture, thus increasing the amount of moisture available to dissolve the plant food and render it available for the crop. The importance also of good drainage is of course well known to every farmer.

Good fitting of the land makes the soil warmer, regulates the moisture supply, destroys weeds, renders the plant food more available and hence increases the farmer's profits.



HOW FERTILIZING INCREASES SIZE OF ROOTS AND IMPROVES SOIL CONDITION

This photograph shows grass roots to a depth of three feet, fertilized and unfertilized. It shows how top-dressing with high-grade fertilizers, if properly made, increases the volume of grass roots, which add humus when the land is afterwards plowed for hoed crops.

XI. BY PLANTING CROPS ON SUITABLE SOIL

How often the remark is heard, "I always get a good crop of potatoes on this field, while over there they don't do as well." There may be several reasons for such conditions, but the principal one is undoubtedly the adaptability of certain soils to certain crops.

Some soils are better fitted to certain crops than to others. Grass and grain will do better than potatoes or sugar beets on a heavy clay soil. Alsike clover thrives better than timothy and red clover on low moist land. Similar conditions are known to every farmer.

By observing and studying the results obtained from different crops on his various fields, the farmer is able to turn the natural advantages of his farm to good account, and make more money with his fertilizer. Much can be done however by means of proper rotation, thorough cultivation, and liberal fertilization, to make the poorest part of the farm as productive as the best. As Prince Kropotkin of Russia, has said: "*In the hands of men* there are no unfertile soils."

XII. BY BUYING AT THE RIGHT PRICES

To make money with fertilizers, they should not be bought on a "lowest price" basis. Remember, a fertilizer is not bought for its bulk, but for the plant food it contains. It costs as much to manufacture, mix, bag, sell and ship a ton of low-grade fertilizer as it does a ton of high-grade. Consequently the cost of a pound of plant food is less in high-grade than in low-grade goods. Buy high-grade fertilizers. The plant food will cost you less and your profit will be greater.

XIII. BY HELPING OUT WITH SPRAYING

A successful potato grower who was noted for the large yields he secured with commercial fertilizer, was asked why he sprayed his crop. He replied: "Because it pays to look after the top as well as the bottom." In other words, he knew from experience that in order to develop a full crop of tubers he needed all the tops, instead of allowing them to become the prey of bugs and blight. Attention to the bottom of the crop in the form of good fertilizer, good seed and good tillage pays better for the additional attention given to the top in the form of spraying. This also applies in a general way to most fruits and vegetables.

A Florida orange grove near Auburndale, on which A.A.C. fertilizers were used. A number of the trees are 25 to 30 feet high with a spread of 25 feet. The grower is particularly pleased with the superior keeping quality of the fruit.

XIV. BY GOOD COMMON SENSE

Plant food in the form of good fertilizers is just plant food. There is no mystery about it. If it is good practice and good management to supply plant food in the form of stable manure, or by growing green crops and turning them under, it is good business and good farming to supply plant food in the form of commercial fertilizer. But, as we have shown, it requires headwork to make the most money with fertilizers. In other words, the use of good fertilizers belongs to good farming, which really comes back to practical knowledge and good common sense.

XV. BY PROPER USE OF MANURE

A word in regard to manure. Because we are interested in the manufacture and sale of commercial fertilizers, it should not be understood that we are opposed to the use of good barn manure, for we are not. Barnyard manure is good for the organic matter it contains, its heat, and as a foundation of farm fertility; but it is difficult to apply after the crop has started; and its composition cannot be varied to meet the demands of different crops. Neither is it possible to procure all that is necessary. Manure is particularly valuable because of its mechanical effect upon the land. It adds humus to the soil. Humus, in turn, aids in retaining the soil moisture, improves the texture of the soil, and tends to increase the number of soil bacteria. The nitrogen, phosphoric acid, and potash found in stable manure are important plant foods, and the manure made on the farm should be carefully stored and judiciously applied. For many crops manure is not a well-balanced fertilizer and for the most profit should be strengthened with a good fertilizer.

The best place to apply stable manure is on land that is to be planted to corn. Corn is a gross feeder, and can make the best use of the plant food contained in coarse manure. The cultivation of the corn will also destroy the weeds growing from the seeds contained in the manure. It is not advisable to apply manure to land intended for potatoes as it has been found that this tends to produce scabby potatoes.

The quality of manure and its value for fertilizing purposes depends upon the age of the animal and what it is fed. Manure from cattle fed on corn stalks and poor hay or straw contains very little plant food, while manure from animals fed on alfalfa or clover hay and cottonseed meal is proportionately richer. The animal adds no plant food to the material it eats. It takes out some of

A tobacco plantation in Porto Rico fertilized with A.A.C. fertilizer.

the plant food, or merely changes its form. For this reason, and considering the actual plant food content, the labor required to apply it, the danger of introducing noxious weeds, and plant and animal diseases, the purchase of manure to use on the farm is usually unprofitable.

The farmer of today is using plant food from all available sources, and a combination of manure, green crops, and commercial fertilizers will usually be found the most profitable. Each form has its advantages, and by taking into consideration the food requirement of the crops, the form in which they can best utilize their food, and the cost of supplying this fertility, the farmer finds that he can make the most money by the intelligent use of commercial fertilizers.

XVI. BY TAKING ADVANTAGE OF A.A.C. SERVICE

Other things being equal, as between two farmers using fertilizer, the one who gets the best value in his fertilizer will make the most money. He has not learned "how to make money with fertilizers" until he has learned how to get the most for his money in buying them.

ITS IMPORTANCE

The American Agricultural Chemical Company is one of the largest manufacturers and sellers of mixed special and general fertilizers in the United States. The company manufactures or delivers its fertilizers from sixty distributing points east of the Mississippi River, giving its customers the advantage of prompt shipments and short freight hauls. Photographs of some of these plants are included in this book, made from engineers' drawings, drawn to proper scale and perspective.

ITS CHEMICAL RESEARCH WORK

Not only has it in active operation seventeen chemical laboratories, each in charge of a skilled chemist with assistants, but through a chief chemist in charge of the scientific work of the company this force works together along research and analytical lines, in constant touch with every new thought and development that affects the problem of plant food and the practical use of fertilizers. Only a very large concern can afford to provide service of this magnitude. Such service benefits every customer, yet it is often overlooked when fertilizers are purchased.

LIEBIG WORKS AT CARTERET, N. J.

ITS OLD ESTABLISHED BRANDS

The brand names of the fertilizers it manufactures are probably the best known of any fertilizers sold in this country.

They have been on the market for sixty years, and as a result of the extensive publicity given by farmers to the results obtained, they are known everywhere as high standards of quality.

EXPERIENCE IN MANUFACTURING

It goes without saying that the men in charge of the manufacturing are competent and experienced in their particular lines. Advantage is taken of any improvement in manufacturing methods and machinery, and in fact many methods that are new have been developed in the company's plants. Departments and processes are so arranged as to reduce lost motion and unproductive labor to a minimum.

RAW MATERIALS

As the company is so large a manufacturer, it is, perhaps, the largest single buyer of such raw materials as it does not manufacture. The advantages due to this fact are many, resulting in better fertilizers for a given amount of money. The company also mines rock phosphate from its own deposits, makes its own sulphuric acid, and manufactures its own acid phosphate, and is thus

MICHIGAN CARBON WORKS AT DETROIT, MICHIGAN.

WORKS AT WILMINGTON, N. C.

able to control every step in the manufacture of this most important fertilizer constituent.

In addition to the manufacture of acid phosphate, several rendering plants are operated in order to obtain that portion of the organic material required by high-grade fertilizers. This gives the company a constant supply of blood, bone, tankage, etc. This is another reason why it can give the farmer the most for his money, enabling him to make more money with his fertilizer.

The company also maintains an

AGRICULTURAL SERVICE BUREAU.

The Chief of the Agricultural Service Bureau, H. J. Wheeler, was graduated from the Massachusetts Agricultural College. He subsequently took the degree of Doctor of Philosophy at the University of Goettingen, Germany, and later was given the honorary degree of Doctor of Science by Brown University. For four years Dr. Wheeler was assistant to the late Dr. Charles A. Goessmann, at the Massachusetts Agricultural Experiment Station, and for twenty-two years was connected with the Rhode Island Agricultural Experiment Station, of which he was first Chief Chemist and subsequently for twelve years its Director.

BRADLEY WORKS AT NORTH WEYMOUTH, MASS.

A well-fertilized field of tobacco at Southwick, Massachusetts. Much of the land used for this crop in the Connecticut River Valley now commands from $500 to $1000 an acre, and much of this value has been brought about by the constant use of commercial fertilizers.

BOWKER WORKS AT CINCINNATI, OHIO

FIELD MEN

The field staff of the Bureau consists of a superintendent of each of the company's experimental and demonstration farms in the East, Middle West, and South; also, a field assistant assigned to work in Missouri, Illinois, Oklahoma, and other nearby states. Another field assistant is assigned to work in Wisconsin, Ohio, and other middle western states. Other assistants are engaged in caring for the details of fertilizer tests in New England and other eastern states. Cuba and Porto Rico conditions are also being studied by a competent field man in those islands.

CO-OPERATORS

The Agricultural Service Bureau is working in many different states in co-operation with several hundreds of farmers on the general principle that many of the important fertilizer problems can best be solved on the farm rather than in an office or laboratory.

SCIENTIFIC ASSISTANTS

Attached to the Boston office of the Agricultural Service Bureau to assist Dr. Wheeler are three scientifically trained agricultural assistants, two of whom have held professorships in agricultural colleges. They are employed in connection with the details of the experimental work — in lecturing, in the preparation of bulletins and circulars, and in connection with educational exhibits at agricultural meetings in different parts of the country.

FIELD EXPERIMENTS

For the past four years experiments involving the compounding of special fertilizers for potato culture have been in progress in Maine. Similar experiments have been made with a number of important farm crops in all of the New England States, New York, and New Jersey. An experimental and demonstration farm of 135 acres is being conducted in New England. Similar work of demonstration and experiment is being done on a large farm in northern Ohio on acre and half-acre plots. Carefully planned experiments with citrus fruits have just been begun in a newly-planted grove in Florida. Plans are being perfected for extensive experiments in the same state with truck and other miscellaneous crops. In 1916 experiments with various crops were conducted on more than fifty farms in Wisconsin, and demonstration and experimental work has been in progress for three years in Illinois, Missouri, Oklahoma, and other nearby states.

Our Agricultural Service Bureau offers farmers an opportunity to have their soils tested free of charge as to their need of liming. Full instructions for drawing samples are contained in Bulletin No. 1 of the Bureau, which will be sent free to any address.

The Bureau will also, on request, give advice on general agricultural matters, including the use of fertilizers for different crops, the use of lime and general soil treatment, as well as the best cultural methods for differing crops, soils and climates.

No charge is made for this service.

CROCKER WORKS AT BUFFALO, N. Y

CLEVELAND DRYER WORKS AT CLEVELAND, OHIO

Publications of the Agricultural Service Bureau of

The American Agricultural Chemical Company

Mailed Free to any Address

BULLETIN NO. 1 — Instructions for Sampling and Forwarding Soils to be Tested as to their Need of Lime.

BULLETIN NO. 2 — Vetch and its Culture.

BULLETIN NO. 3 — Seeding to Grass and Clover.

BULLETIN NO. 4 — Alfalfa and Its Culture.

BULLETIN NO. 5 — Cranberry Fertilization.

BULLETIN NO. 6 — Winter Wheat and Its Culture.

BULLETIN NO. 7 — Top-Dressing Grassland and Pastures.

BULLETIN NO. 8 — Corn and Its Culture.

CIRCULAR NO. 1 — Treatment of Potato Scab.

CIRCULAR NO. 2 — The Effect of Acid Phosphate on Soils.

CIRCULAR NO. 3 — The Use of Fertilizer Desirable Despite the Potash Shortage.

CIRCULAR NO. 4 — The Effect of Ground Limestone and Other Substances on the Efficiency of Certain Phosphates.

CIRCULAR NO. 5 — Fertilizing for the Second Grass Crop and for Fall Seeding.

LIME AND FERTILIZER.

CROPS THAT PAY.

Upland cotton growing on A. A. C. fertilizer near Albany, Georgia.

OTHER PUBLICATIONS FOR FREE DISTRIBUTION TO FARMERS

How to Get a Crop of Potatoes.
How to Get a Crop of Corn.
How to Get a Crop of Wheat.
How to Get a Crop of Hay.
How to Get a Crop of Cotton.
How to Get a Crop of Clover.
How to Get a Crop of Alfalfa.
How to Get a Crop of Oats.
How to Get a Crop of Tomatoes.
How to Get a Crop of Cabbage.
How to Get a Crop of Beans.
How to Get a Crop of Onions.
Money-Making Corn.
Potatoes, a Money Crop.
Money-Making Hay.
Where the Fertility Goes.
Plant Food, by the late William H. Bowker.
How Thirty Farmers Won $3000.
The Red Lands of Cuba; their Cultivation and Fertilization.
A Method of Cultivation for the Heavy Black Lands of Cuba.
The Cultivation of Ratoons in Porto Rico.
Liming for Profit.
Protox for Poultry.

Every farmer interested is invited to send to any one of our offices for free copies of these pamphlets. They are worth careful reading.

LAZARETTO WORKS AT BALTIMORE, MD.

How Some Farmers Miss the Greatest Profit

I. BY USING IMPROPER FORMS OF PLANT FOOD

The form of the plant food, or in other words the kind of materials used in compounding the fertilizer, is often of as much consequence as the proper balancing of the formula. For example, in the case of two fertilizers containing the same amounts of ammonia, phosphoric acid, and potash, the investigations of the Agricultural Service Bureau of this company have shown that one which was properly compounded would readily give a crop of cranberries worth from $40.00 to $50.00 an acre more than the other. Similarly, the difference in the crop-producing power of potato fertilizers having the same analysis may vary to the extent of from thirty to forty bushels of potatoes to the acre. Equally wide variations in the effectiveness of fertilizers for onions, tobacco, and other special crops might be cited. In the case of grass, cotton, cereals and other staple crops, similar though less striking differences in yield may result.

The sources of the ammonia in fertilizers must be different, dependent upon the climate and upon the character of the soil. In the North where the nights are long and the average temperature low, the fertilizer ingredients must be more quickly available than in the South. For open sandy and gravelly soils, fertilizers must contain their plant food in forms which are not readily leached away by heavy rains.

For tobacco, the particular variety grown and the character of the soil must determine what materials should be used in the manufacture of the fertilizer. For the better types of wrapper and binder

WORKS AT SAVANNAH, GA.

tobacco, potash salts which contain chlorine are not suitable. The materials used to supply the ammonia and phosphoric acid also exert a marked effect upon the burning quality and the ability of the tobacco to pass satisfactorily through the processes of fermentation.

For rice, sugar beets, hops, citrus fruits, and many other crops, the choice of the forms of plant food is often of more importance, as concerns the value of the crop, than the proportions of the various ingredients, at least within reasonable limits of variation.

II. BY USING UNSUITABLE FORMULAS

While the sources of the plant food ingredients used in the fertilizer are often of the greatest consequence, the adaptability of the fertilizer is likewise important. In most of the Middle West, phosphoric acid is the soil ingredient which is chiefly deficient, and hence its proportion in the fertilizer should be especially high.

BIGBEE WORKS AT MONTGOMERY, ALA.

A ratoon field in Cuba ready for barring off and fertilizing. A.A.C. fertilizers are used extensively in the West Indies for sugar cane and other crops.

WORKS AT NEWARK, N. J.

III. BY USING UNNECESSARY ELEMENTS OF PLANT FOOD

In the case of soils which have been frequently and heavily manured with barnyard manure, neither additional nitrogen nor potash may be necessary for crop production, and the first requirement is likely to be phosphoric acid. The second deficiency to arise, especially on light sandy and gravelly soils, may be potash. On some clayey soils additional potash is not needed, on others it will be required only in small amounts, whereas in some cases, dependent upon the origin of the soil and the nature of the previous cropping and manuring, a moderate amount of potash may be required. The general statement that clayey soils are least in need of potash is correct, but it must not be forgotten that different clayey soils require it in different amounts. It is seldom that phosphoric acid is not required as a plant food element in the eastern, southern and middle western parts of the United States. Available nitrogen is deficient in most soils which have not been heavily manured or on which leguminous crops have not been turned under recently, and it is especially deficient on sandy and gravelly loams. To make money with fertilizers, be reasonably certain that you apply plant food as required by soil, climate and crop conditions.

IV. BY NEGLECTING THE USE OF LIME

If lime is not used on very acid soils the growth of alfalfa, clover, barley, wheat, beets, onions and many other important farm crops is impossible. In some cases the yields are merely lessened. Where such conditions prevail, fertilizers cannot perform their normal functions. The availability of the nitrogen in ammoniacal and organic forms is also greatly lessened.

A lack of lime in soils is generally shown by the types of plants which grow naturally. In much of the eastern part of the United

ASHEPOO WORKS AT CHARLESTON, S. C.

States an abundance of common or sheep sorrel, moss, everlasting, blue curls, dewberry, five-finger, Saint John's-Wort (several species), and a species of goldenrod having underground roots (rhizomes) often indicates that lime is needed. In other parts of the country still other kinds of plants may be more indicative of such a requirement.

Since plants vary so widely in their lime requirement, and because lime performs so many different functions in soils, among which are the correction of acidity, the physical improvement of the soil, and the formation of a better habitat for beneficial soil bacteria, no method of analysis can be expected to show just how much lime should be used on any particular soil in order to insure the best results. Much will always depend, therefore, upon individual observation and the exercise of good judgment, even after chemical tests have been made.

One of the first steps to be taken is to determine whether lime is needed, for if it is, neither fertilizer, manure, tillage, nor seed selection, nor all of them will avail to make farming fully profitable, provided crops are to be grown which do not thrive on acid soils. A good method of determining the need of lime is described on page 23.

V. BY FAULTY PREPARATION OF SOIL AND SEED BED

Young plants, like young animals, must have favorable conditions and good care at the outset. The best conditions for small plants are brought about by very thorough pulverization of the soil and by having the surface free from lumps and clods so that the roots can develop normally at the outset. In the case of soils on which alfalfa, wheat, onions, and many other crops are to be grown, it is necessary that they be firm below the immediate surface, whereas for other kinds of plants this feature is relatively less important. If the soil is not in good tilth so that the plant roots have favorable conditions for growth, and unless the physical structure of the soil is

WILLIAMS & CLARK WORKS AT CARTERET, N. J.

such that the soil moisture can rise to the plant roots as needed, fertilizers cannot exert their maximum effect, nor can the available plant food already in the soil be utilized most effectively.

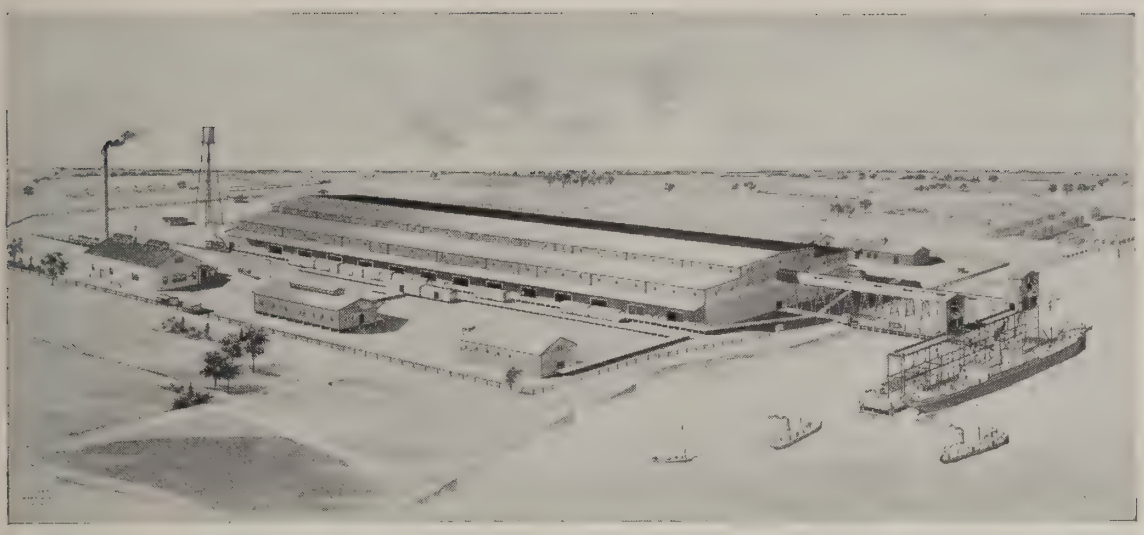
VI. BY PLANTING ON UNSUITABLE SOIL

The crop must be adapted to the soil, for if not, the use of fertilizers, seed selection, tillage, and all efforts will fail to insure satisfactory crops. While wheat will utilize fertilizer to good advantage on many clayey and heavy silt loams, rye may winterkill, whereas on soils ideally adapted to rye, wheat is less likely to succeed. This is only one of many typical illustrations of the fact that the kind of crop, just like the individual types of tobacco must be adapted to the particular soil if money is to be made with fertilizer. The farmer's own observation of crops growing on his own farm must determine the adaptation of certain fields for certain crops.

VII. BY APPLYING FERTILIZERS AT THE WRONG TIME

If fertilizers are not used at the right time, they will not give the best results. For example, for winter grain some fertilizer should be applied with the grain drill at the time the seed is sown in order to encourage a strong vigorous growth before winter sets in, and additional amounts can often be used advantageously as a top-dressing in the early spring. Similarly, when seeding to grass in the autumn enough fertilizer should be used to get it well established before winter.

The fruit of the potato grower's labor in Aroostook County, Maine. Potatoes grown by Hoyt & Wheeler, proprietors Riverview Farm, the Home of Pure Seed, Presque Isle, Maine. A.A.C. fertilizers were used. A yield of 3807 barrels was secured from 19 acres, equivalent to about 550 bushels per acre.



SUBSIDIARY WORKS AT NORFOLK, VA.

For the spring top-dressing of grass, if the stand is thin, fertilizer must be applied early enough to promote abundant tillering or increase of stalks, whereas if the stand is thick, the fertilizer can be applied a little later.

Potatoes are usually fertilized entirely in the drill, at least up to a limit of from 1500 to 2000 pounds to the acre. If the season is moist, as good or possibly better results can often be secured if a small part of the fertilizer is scattered along the drills or is dropped upon the hills and worked in just before the plants appear above the ground. On very sandy soils, especially where the rainfall is heavy, the fertilizer should be applied usually in from two to four periodic applications because of the danger of loss by leaching, if it is all applied to the soil at once. For citrus fruits the applications should be divided, and it is claimed that by using suitable fertilizers before the chief blooming period an increase in the number of blossoms will result.

WORKS AT COLUMBIA, S. C.

GOULDING WORKS AT PENSACOLA, FLA.

For most staple crops on good loam soils, fertilizers generally give better results if applied before the crops are planted than after yet in the case of certain truck crops, later applications often increase the growth and tenderness enough to make such use of additional fertilizer desirable.

VIII. BY APPLYING FERTILIZERS IN THE WRONG MANNER

Fertilizers should never be brought into direct contact with the seed. This is especially important in the case of melons, cucumbers, squashes, and similar sensitive plants. It is usually desirable to apply the fertilizers below the seed rather than above it. On sandy and gravelly soils it is preferable to apply the fertilizer, when possible, a few days in advance of seeding.

If only a small quantity of fertilizer is used, it should be drilled in or applied in the hill when planting. If used in the hill, it must be covered with soil before the seed is dropped. If larger amounts of fertilizer are used, a part may be applied broadcast or by the use of drills or otherwise and thoroughly disked into the soil. If very large amounts are required, all or most of it should be applied broadcast and then disked into the soil.

If no fertilizer or but little has been used in the autumn when seeding winter grain, another application should be made early the next season. If the stand is thin, it should be applied earlier than otherwise in order to promote tillering or an increase of the number of stalks.

Judging the Results

In seeking the best fertilizers for their crops, farmers often apply several fertilizers side by side on the same crop and soil, yet defeat the very object of their experiment by failing to weigh the crop produced and to measure the land on which it grew. The remark "I couldn't see any difference" is altogether too common.

A difference too small to be seen nevertheless can be large enough to pay the whole fertilizer bill.

For example, take an experimental plot ten feet wide by one hundred feet long, containing 1000 square feet. A difference of one bushel of potatoes on such a plot over one of the same size alongside would be too small to be seen, yet it takes forty-three and one-half such plots to make an acre, and the one bushel difference per plot is equal to a difference of forty-three and one-half bushels per acre, or enough to pay for all the fertilizer that would be used. Due credit should also be given to the fertilizer for the increase in succeeding crops in the rotation.

Cutting a 90-acre grass crop at Barton, Vermont. This field was top-dressed in the spring with A. A. C. fertilizer.

If it pays to experiment, it pays to measure the land and weigh the crop. "I couldn't see any difference" means nothing. If you really can answer the question, "*Just what was the difference?*" you will plan your order for fertilizer on positive knowledge —you will *know* where you stand.

OUR CROP CONTESTS

Photographs of crops help to form an idea of how successful farmers have been with our fertilizers; and we are printing some of them in this book. They show, however, only what you can see;— on your own farm the scales and surveyor's tape are the surest guides. If you use them, you will use our fertilizers.

Right here, the crop-growing contests that have been conducted by the company and its branches, show their value. Our company offered $3000 in prizes, distributed $1000 for the best ten crops of corn, $1000 for potatoes and $1000 for wheat; the awards to be made by committees of well-known farmers and business men, every crop to be weighed and witnessed, to come from carefully measured land, and to have been grown on our fertilizers exclusively, no other dressing of any kind being allowed after the preceding crop had been taken off. In every case the land was measured and re-measured by several disinterested parties; the crops were weighed in the presence of witnesses, and the results sworn to before a notary or a justice of the peace. These farmers weighed and measured, and they *knew*. Hence, in printing their results we know also; and you who read can accept these figures as absolutely correct and authenticated in every essential particular.

THE THREE CROP-CONTEST RESULTS SUMMARIZED

Best Yield	Bushels per Acre	Average Yield	Bushels per Acre
Potatoes	375.	10 Prize Winners	331.3
Corn	115.	10 Prize Winners	96.74
Wheat	59.86	10 Prize Winners	48.50

THE CORN CONTEST

In spite of a poor corn season these men nearly trebled their state yield and nearly quadrupled the United States yield.

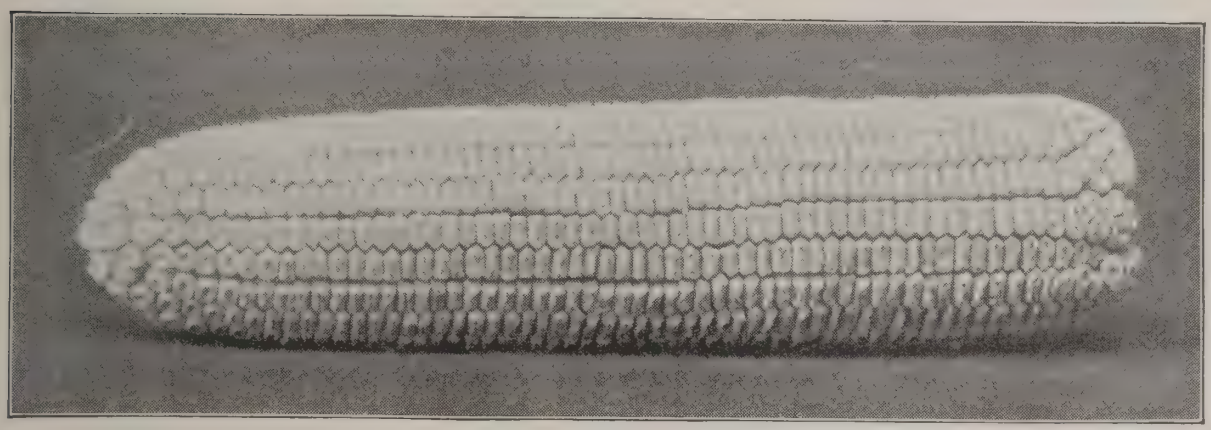
			Yields per acre
First	$100	R. E. McAhren, St. Paul, Ind.	115. bushels
Second	$100	P. P. Pope, Tontogany, Ohio	108. bushels
Third	$100	O. L. Hart, Greenville, Ohio	104.5 bushels

MAKING MONEY WITH FERTILIZERS IN THE ORCHARD

This remarkable contrast in yields of apples with and without fertilizer, as illustrated by the thirty barrels of fruit from the fertilized row of trees at the left and by the three barrels from the unfertilized row at the right, is the result of a careful and long continued test at the Ohio Agricultural Experiment Station.

Fourth	$100	W. A. Groshans, Hamlet, Ind.	103.5 bushels
Fifth	$100	Norris McHenry, Elizabethtown, Ind.	93. bushels
Sixth	$100	W. A. Withrow, New Richmond, Ind.	91.7 bushels
Seventh	$100	Calvin Collier, Bellevue, Ohio.	91.5 bushels
Eighth	$100	W. A. Westfall, Poseyville, Ind.	89.9 bushels
Ninth	$100	Valentine Bender, Poseyville, Ind.	87.1 bushels
Tenth	$100	William Frederick, Corydon, Ind.	82.5 bushels

Average yield obtained by the prize winners	96.74 bushels
Average yield, Ohio and Indiana	36. bushels
Average yield, United States, 1914 (U. S. Year Book)	25.8 bushels



A Perfect Ear of Corn — Johnson County White Dent.

THE POTATO CONTEST

The Ten Prize Winners Trebled their State Yields

			Yield
First	$100	Elmer L. Powers, Vienna, Mich.	375. bushels
Second	$100	E. W. Lincoln, Montcalm, Mich.	354.23 bushels
Third	$100	George Chapman, Attica, Mich.	345.25 bushels
Fourth	$100	A. F. Wallbrecht, Central Lake, Mich.	339. bushels
Fifth	$100	Edwin A. Starr, Royal Oak, Mich.	335.78 bushels
Sixth	$100	Daniel Reish, Wales, Mich.	330.58 bushels
Seventh	$100	Jno. H. Linck, Goodland, Mich.	323.08 bushels
Eighth	$100	Jennings Sparling, Colfax, Mich.	305. bushels
Ninth	$100	Frank Brown, Waupun, Wis.	304.15 bushels
Tenth	$100	Floyd I. Faunce, Summerfield, Mich.	301.23 bushels

Average yield obtained by the prize winners	331.3 bushels
Average yield, Indiana, Wisconsin, and Michigan	110. bushels
Average yield, United States, 1914 (U. S. Year Book, 1915)	110.5 bushels

A.A.C. FERTILIZERS ON CUBAN SUGAR CANE
The rows of ratoon cane at the left were fertilized. Those at the right were not.

One of the Prize Crops

THE WHEAT CONTEST

All the winners trebled the United States yield

			Yield
First	$100	P. P. Suter, Waterville, Ohio	59.86 bushels
Second	$100	Dewey Hanes, Arcanum, Ohio	55.77 bushels
Third	$100	J. K. Spitler & Sons, Bloomville, Ohio	52.40 bushels
Fourth	$100	George H. Zechman, Republic, Ohio	48.60 bushels
Fifth	$100	Charles Klick, Massillon, Ohio	47.65 bushels
Sixth	$100	W. C. Gregg, Sycamore, Ohio	47.37 bushels
Seventh	$100	Marshall T. Smith, Mt. Gilead, Ohio	45.62 bushels
Eighth	$100	George H. Sands, Milan, Ohio	43.50 bushels
Ninth	$100	C. C. Schild, Havana, Ohio	42.30 bushels
Tenth	$100	Adam Giessler, Wren, Ohio	42.03 bushels

Average yield obtained by the prize winners	48.5 bushels
Ohio average yield	16.2 bushels
United States average yield (U. S. Year Book)	14.8 bushels

What did these men do that you can't do? Absolutely nothing. You are farming the same soils, you can obtain as good seed, you can obtain the same fertilizer. Why not try it on your own farm? Send for free copy of our pamphlet "How 30 Farmers Won $3000," containing descriptions of the methods used by the prize winners and other contestants.

Consumption of Fertilizers by States in 1914 as Estimated by the Editor of "American Fertilizer."

State	Tons
Alabama	592,200
Arkansas	84,850
California	39,471
Colorado	3,500
Connecticut	85,000
Delaware	55,000
Florida	240,812
Georgia	1,282,088
Idaho	1,500
Illinois	75,000
Indiana	219,000
Iowa	4,200
Kansas	9,460
Kentucky	83,000
Louisiana	90,588
Maine	168,000
Maryland	183,350
Massachusetts	150,000
Michigan	60,000
Minnesota	3,800
Mississippi	127,400
Missouri	65,000
Montana	1,100
Nebraska	1,250
New Hampshire	50,000
New Jersey	155,414
New Mexico	1,200
New York	490,000
North Carolina	872,820
North Dakota	1,250
Ohio	203,000
Oklahoma	29,000
Oregon	6,300
Pennsylvania	381,900
Porto Rico	18,164
Rhode Island	20,000
South Carolina	1,095,728
Tennessee	93,550
Texas	77,400
Utah	1,200
Vermont	27,500
Virginia	437,808
Washington	2,400
West Virginia	35,475
Wisconsin	4,500
Arizona, Nevada, South Dakota and Wyoming	3,000
Total	7,629,228 Tons

A mammoth crop of fine celery grown on A.A.C. fertilizers by Mr. Geo. F. Fish, Orange County, N. Y.

Factory and Sales Service

THE AMERICAN AGRICULTURAL CHEMICAL COMPANY

29 PRINCIPAL FACTORIES AND WAREHOUSES
22 LEADING SALES AND EXECUTIVE OFFICES

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